

# Remote Sensing Image Scene Classification Meets Deep Learning: Challenges, Methods, Benchmarks, and Opportunities

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## Abstract

Remote sensing image scene classification, which aims at labeling remote sensing images with a set of semantic categories based on their contents, has broad applications in a range of fields. Propelled by the powerful feature learning capabilities of deep neural networks, remote sensing image scene classification driven by deep learning has drawn remarkable attention and achieved significant breakthroughs. However, to the best of our knowledge, a comprehensive review of recent achievements regarding deep learning for scene classification of remote sensing images is still lacking. Considering the rapid evolution of this field, this article provides a systematic survey of deep learning methods for remote sensing image scene classification by covering more than 160 papers. To be specific, we discuss the main challenges of remote sensing image scene classification and survey: first, autoencoder-based remote sensing image scene classification methods; second, convolutional neural network-based remote sensing image scene classification methods; and third, generative adversarial network-based remote sensing image scene classification methods. In addition, we introduce the benchmarks used for remote sensing image scene classification and summarize the performance of more than two dozen of representative algorithms on three commonly used benchmark datasets. Finally, we discuss the promising opportunities for further research.